



ABSTRACT AND BIOGRAPHY

Stardust Lessons Learned: Why the Value to the CEV Program could be Greater

Failure to consider the future technology implications which lie outside of primary mission goals may lead to an unnecessary loss of information of future value to NASA. NASA's Stardust Sample Return Capsule was the first to employ PICA, Phenolic Impregnated Carbon Ablator, as the forebody thermal protection layer. The same ablator has been proposed for the heatshield of the Orion CEV. Since the re-entry conditions for the Stardust capsule exceeded those expected for Orion, Stardust represents a unique learning opportunity for the Constellation Program.

The informative value of the returned Stardust heatshield could be greater, however. The lack of pre-flight measurements of the heatshield make it impossible to obtain quantitative determination of recession, asymmetry in recession rates...etc. We discuss how such oversights occur and might be mitigated in the future. Outstanding efforts by a multi-partner team have, however, been able to maximize the information garnered from the study of Stardust and obtain valuable information for Constellation. The difficulties in obtaining and interpreting these results extends beyond a lack of pre-launch technical data and includes experiential lessons learned in recovery and post-processing. We will discuss these lessons learned how they can be used to improve the Orion test program and recovery planning.

Karen M. McNamara
NASA Stardust and Genesis Space Exposed Hardware Lead
NASA Johnson Space Center

Dr. McNamara is the NASA Curator for Stardust and Genesis Space Exposed Hardware. In that position, she coordinated agency-wide efforts to study the returned Stardust heatshield for its relevance to the Orion CEV thermal protection system. She is responsible for the application of advanced CT scanning techniques to the PICA heatshield to generate an unprecedented level of information and understanding on the heatshield's performance.

Prior to this position, Dr. McNamara served as the JSC Recovery Lead for both the Stardust and Genesis Sample Return Missions, as well as the JSC Mission Lead for the Genesis Mission. She received the NASA Exceptional Achievement Medal for her work on the Genesis Mission. These two missions represent NASA's first and only sample return missions and space capsule recoveries since Apollo.

Dr. McNamara received her Ph.D. and Master's Degree from MIT and her Bachelor's Degree from the Johns Hopkins University. All three were in chemical engineering. She studied management at MIT's Sloan school as well. Before coming to NASA, Dr. McNamara was a professor at the Worcester Polytechnic Institute in Massachusetts. Her



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research focus was advanced materials including: development of materials for space applications, synthesis and characterization of synthetic diamond, and authentication and restoration of art and historical objects. Ninety-six students have completed their thesis work under Dr. McNamara's direction.